WHAT IS CLAIMED IS:

1. A reflective display device comprising:

a display layer;

an optical element placed on an observer side of said display layer; and

a reflection element placed on a side of said display layer opposite to said observer side,

wherein said optical element has a principal plane including a plurality of tilt faces tilted with respect to a display plane, and

a light ray incident on said display layer through said optical element and reflected by said reflection element is allowed to outgo in a direction roughly normal to said display plane.

2. The reflective display device according to claim 1, wherein said principal plane of said optical element faces said observer side.

3. The reflective display device according to claim 1, wherein said principal plane of said optical element faces a side of said reflection element.

4. The reflective display device according to claim 1, further comprising a scattering element for scattering light reflected by said reflection element,

wherein the light ray incident on said display layer through said optical element and reflected by said reflection element is allowed to outgo in said direction roughly normal to said display plane by a combination of said optical element, said reflection element, and said scattering element.

5. The reflective display device according to claim 1, wherein the light ray incident from a direction tilted toward the upper side of said display plane with respect to the direction normal to said display plane outgoes in a direction roughly normal to said display plane.

6. The reflective display device according to claim 5, wherein said light ray is emitted from a first light source placed on said observer side of said optical element at a position tilted toward the upper side of said display plane with respect to the direction normal of said display plane.

7. The reflective display device according to claim 1, wherein an angle of said plurality of tilt faces with respect to said display plane is set so that some of the light ray incident from a direction tilted by an angle in a range of about 10 degrees to about 45 degrees with respect to a direction normal to said display plane outgoes in a direction roughly normal to said display plane.

8. The reflective display device according to claim 1, wherein said plurality of tilt faces are tilted at a predetermined angle with respect to said display plane, and said predetermined angle is 7 degrees or more.

9. The reflective display device according to claim 1, wherein said optical element has a plurality of other faces having an arbitrary angle with respect to said display plane, and said plurality of tilt faces and said plurality of other faces are formed alternately.

10. The reflective display device according to claim 9, wherein said plurality of other faces of said optical element have an angle of about 90 degrees with respect to said display plane.

11. The reflective display device according to claim 9, wherein a reflection layer is formed on each of said plurality of other faces of said optical element.

12. The reflective display device according to claim 9, wherein an absorption layer is formed on each of said plurality of other faces of said optical element.

13. The reflective display device according to claim 9, wherein said plurality of other faces of said optical element are rough faces.

14. The reflective display device according to claim 1, wherein the angle of said plurality of tilt faces with respect to said display plane varies in said display plane.

15. The reflective display device according to claim 1, wherein said plurality of tilt faces are curved.

16. The reflective display device according to claim 9, wherein a direction of a normal vector to one of said plurality of tilt faces is different from a direction of a normal vector to one of said plurality of other faces.

17. The reflective display device according to claim 1, wherein said optical element is a prism array sheet including a plurality of prisms in an array, and a pitch of the prisms is 200 μm or less.

18. The reflective display device according to claim 1, wherein said optical element is a prism array sheet including a plurality of prisms in an array, and a pitch of the prisms is 5 μm or more and a half or less of a pixel pitch of said reflective display device.

19. The reflective display device according to claim 17, wherein

said prisms are arranged at a random pitch in said display plane.

20. The reflective display device according to claim 18, wherein said prisms are arranged at a random pitch in said display plane.

21. The reflective display device according to claim 1, wherein pixels of said reflective display device are arranged in at least a first direction, said optical element is a prism array sheet including a plurality of prisms arranged in at least a second direction, and said first direction and said second direction form an angle in a range of about 5 degrees to about 85 degrees.

22. The reflective display device according to claim 1, wherein an anti-reflection film is formed on said optical element on said observer side.

23. The reflective display device according to claim 2, wherein said plurality of tilt faces of said optical element are subjected to anti-glare treatment.

24. The reflective display device according to claim 1, further comprising a second light source placed on a side of said optical element, and said optical element functions as a light guide element.

25. The reflective display device according to claim 1, wherein said optical element is made of a material having a variable refractive index n1.

26. The reflective display device according to claim 1, wherein a protection sheet is formed on said plurality of tilt faces of said optical element.

27. The reflective display device according to claim 2, wherein a polarizing plate is placed on said optical element on said observer side via an air layer.

28. The reflective display device according to claim 2, wherein a retardation plate is placed on said optical element on said observer side via an air layer, and a polarizing plate is placed on said retardation plate on said observer side.

29. The reflective display device according to claim 27, wherein said optical element is made of an optically isotropic material.

30. The reflective display device according to claim 28, wherein said optical element is made of an optically isotropic material.

31. The reflective display device according to claim 1, wherein a polarizing plate and a retardation plate are placed on said optical element on said observer side, and said polarizing plate and said retardation plate substantially satisfy a quarter λ condition.

32. The reflective display device according to claim 1, wherein a base material is placed in contact with said optical element on the side of said reflection element, and said base material and said optical element have roughly the same refractive index.

33. The reflective display device according to claim 1, wherein an additional optical element is placed between said display layer and said optical element to separate display light from light reflected by at least one of interfaces formed by the optical element, the display layer and the reflection element.

34. The reflective display device according to claim 33, wherein said additional element has a plurality of tilt faces tilted with respect to said display plane on said observer side.

35. The reflective display device according to claim 2, wherein a refractive index of said optical element is greater than a refractive index

of a medium located immediately above said plurality of tilt faces, and a direction normal to said plurality of tilt faces of said optical element is tilted toward a lower side of said display plane with respect to a direction normal to said display plane.

36. The reflective display device according to claim 2, wherein said plurality of tilt faces of said optical element are in contact with an air, and an angle α of said plurality of tilt faces with respect to said display plane and a refractive index n1 of said optical element satisfy

$2\alpha - \arcsin(\sin\alpha/n1) < \arcsin(1/n1)$.

37. The reflective display device according to claim 2, wherein when an outgoing angle θ_{out} of the light ray incident from a direction normal to said display plane satisfies

$\theta_{out} = \arcsin[n1 \cdot \sin\{2\alpha - \arcsin(\sin\alpha/n1)\}] - \alpha$,

an angle α of said plurality of tilt faces with respect to said display plane and a refractive index n1 of said optical element satisfy

$0^\circ < \arcsin[n1 \cdot \sin\{2\alpha - \arcsin(\sin\alpha/n1)\}] - \alpha < (90 - \alpha)^\circ$.

38. The reflective display device according to claim 1, further comprising a pair of substrates sandwiching said display layer,

wherein said optical element is placed between one of said pair of substrates and said display layer.

39. The reflective display device according to claim 1, wherein said plurality of tilt faces of said optical element are flattened with a transparent base material.

40. The reflective display device according to claim 1, wherein said plurality of tilt faces of said optical element are flattened with a transparent base material, and when a refractive index n1 of said optical element, a refractive index n2 of said transparent base material, and a refractive index (1.0) of an air in contact with said transparent base material have a relationship of n1>n2>1, a tilt angle α of said plurality of tilt faces of said optical element satisfies both

$2\alpha - \arcsin(\sin\alpha \cdot n2/n1) < \arcsin(n2/n1)$ and

$\arcsin[(n1/n2) \cdot \sin\{2\alpha - \arcsin((n2/n1) \cdot \sin\alpha)\}] - \alpha < \arcsin(1/n2)$.

41. The reflective display device according to claim 1, wherein a refractive index of said optical element is smaller than a refractive index of a medium located immediately above said plurality of tilt faces, and a direction normal to said tilt faces of said optical element is tilted toward an upper side of said display plane with respect to a direction normal to said display plane.

42. The reflective display device according to claim 41, wherein

said plurality of tilt faces of said optical element are flattened with a transparent base material, and when a refractive index n1 of said optical element, a refractive index n2 of said transparent base material, and a refractive index (1.0) of an air in contact with said transparent base material have a relationship of $1 \leqq n1 < n2$, a tilt angle α of said plurality of tilt faces of said optical element satisfies both

$\alpha < \arcsin(n1/n2)$ and

$\alpha - \arcsin[(n1/n2) \cdot \sin\{2\alpha - \arcsin((n2/n1) \cdot \sin\alpha)\}] < \arcsin(1/n2)$.

43. The reflective display device according to claim 1, wherein said optical element has a back surface opposite to said principal plane and in parallel with said display plane, and a protection plate is placed on said back surface.

44. A prism array sheet used for a reflective display device, wherein said prism array sheet is placed on said reflective display device on an observer side,

a plurality of tilt faces tilted with respect to a display plane of said reflective display device are formed on said observer side, said plurality of tilt faces being in contact with an air, and

an angle α of said plurality of tilt faces with respect to said display plane and a refractive index n1 of said prism array sheet satisfy

$2\alpha - \arcsin(\sin\alpha/n1) < \arcsin(1/n1)$.

45. The prism array sheet according to claim 44, wherein the angle α of said plurality of tilt faces is 7 degrees or more.

46. The reflective display device according to claim 44, wherein an angle of said plurality of tilt faces with respect to said display plane is set so that some of the light ray incident from a direction tilted by an angle in a range of about 10 degrees to about 45 degrees with respect to a direction normal to said display plane outgoes in a direction roughly normal to said display plane.

47. The prism array sheet according to claim 44, wherein an outgoing angle θ_{out} of a principal ray of light incident on said reflective display device from a direction normal to said display plane satisfies

$\theta_{out} = \arcsin[n1 \cdot \sin\{2\alpha - \arcsin(\sin\alpha / n1)\}] - \alpha$ and

$0^\circ < \theta_{out} < (90 - \alpha)^\circ$.

48. The prism array sheet according to claim 44, wherein said prism array sheet is made of an optically isotropic material.